

1.) Water Resource Assessment of the Rio San Jose Basin



2.) The Source of Groundwater and Solutes to Many Devils Wash at a Former Uranium Mill Site in Shiprock, New Mexico



3.) Uranium mobility and accumulation along the Rio Paguete, Jackpile Mine in Laguna Pueblo, NM

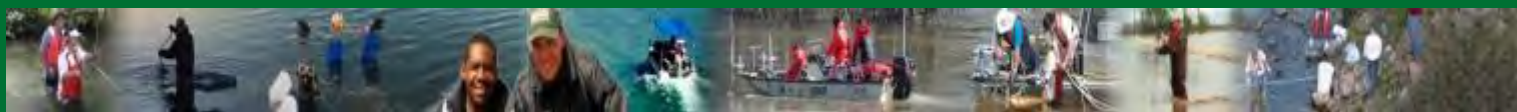


New Mexico
EPSCoR



Johanna Blake, Ph.D.

Andrew Robertson, M.S.



Water Resource Assessment of the Rio San Jose Basin, West-Central New Mexico

Background:

Water resources in the Rio San Jose Basin are limited, and development for public supply, mining, agriculture, and commercial activities have the potential to affect the water availability and quality at a basin-wide scale. This study is designed to provide water-resource managers with better information to plan for potential effects of increased or shifting demands and changes of climatic conditions, to fairly administer water rights, and to support sustainable development. To provide these tools and information, it is necessary to understand what surface-water and groundwater resources are available, how these resources are interconnected, and how the resources might be affected by changing stresses.

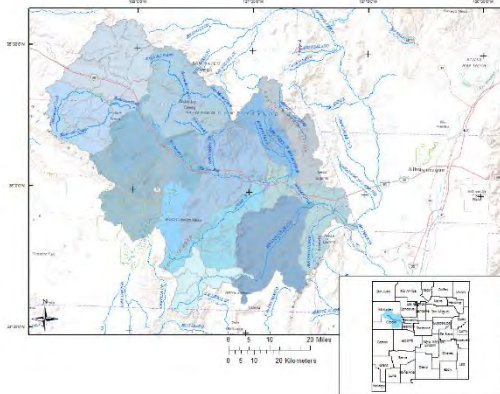
Approach:

- Collect and compile hydrologic information, including groundwater-level measurements, streamflow data, well log information, and aqueous geochemical analysis;
- Construct hydrogeologic framework, potentiometric-surface maps, sources of recharge, groundwater flow paths, and groundwater/surface water exchange;
- Develop coupled groundwater/surface-water flow model (GSFLOW) to investigate aquifer-stream interactions, provide water budgets, and simulate effects of current and potential groundwater and surface-water management and changing climatic conditions.

Objectives:

Characterize the hydrogeologic framework and water resources of the Rio San Jose Basin;

Create a watershed management tool to evaluate the possible regional effects of different water-use and climate scenarios on the basin's water-resources.



Administrative Details:

Timeline – FY2015 to 2019

Project Chief – Andrew Robertson
(ajrobert@usgs.gov)

Status – Active

Cooperator(s) – Pueblo of Acoma, Pueblo of Laguna, Bureau of Reclamation

Data and Other Details available at –
<http://nm.water.usgs.gov/projects/rio.san.jose>



Water Resource Assessment of the Rio San Jose Basin

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Water Resource Assessment of the Rio San Jose Basin

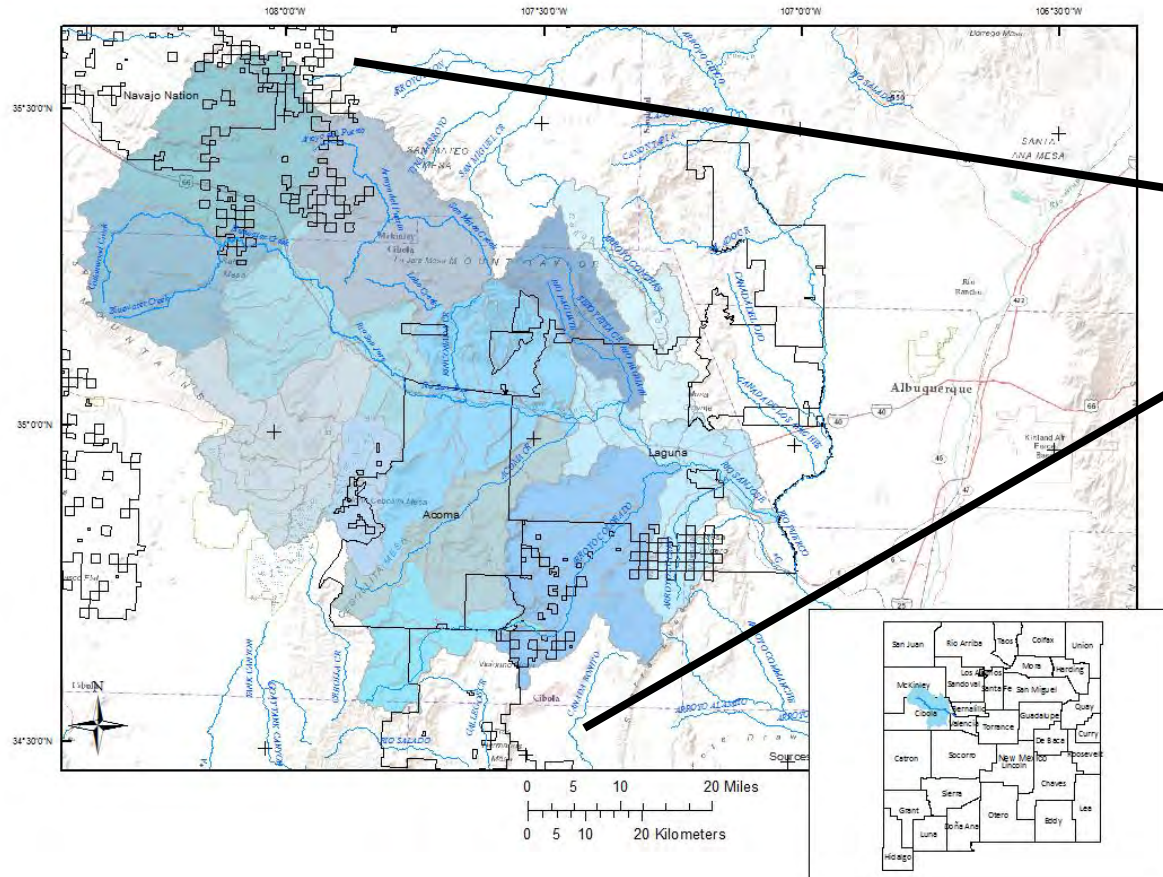
- Project is funded through 638 contracts from the Pueblos of Acoma and Laguna from BOR funds earmarked for tribal water rights.
- \$1,150,000
- Timeline: FY15 to 2019



Pueblo of Acoma
HAAKU



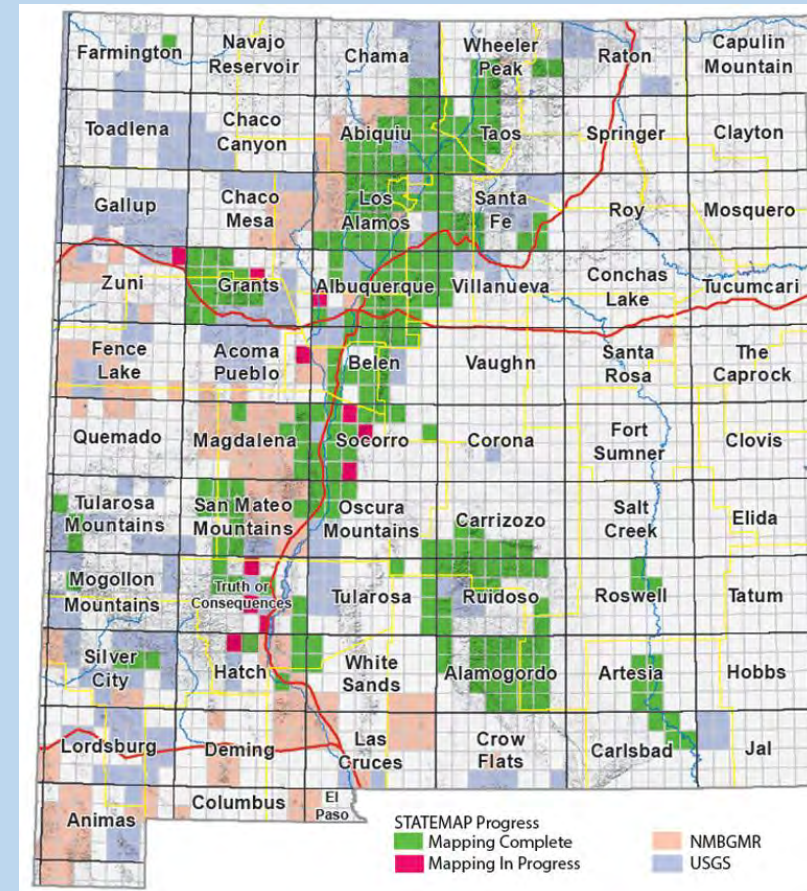
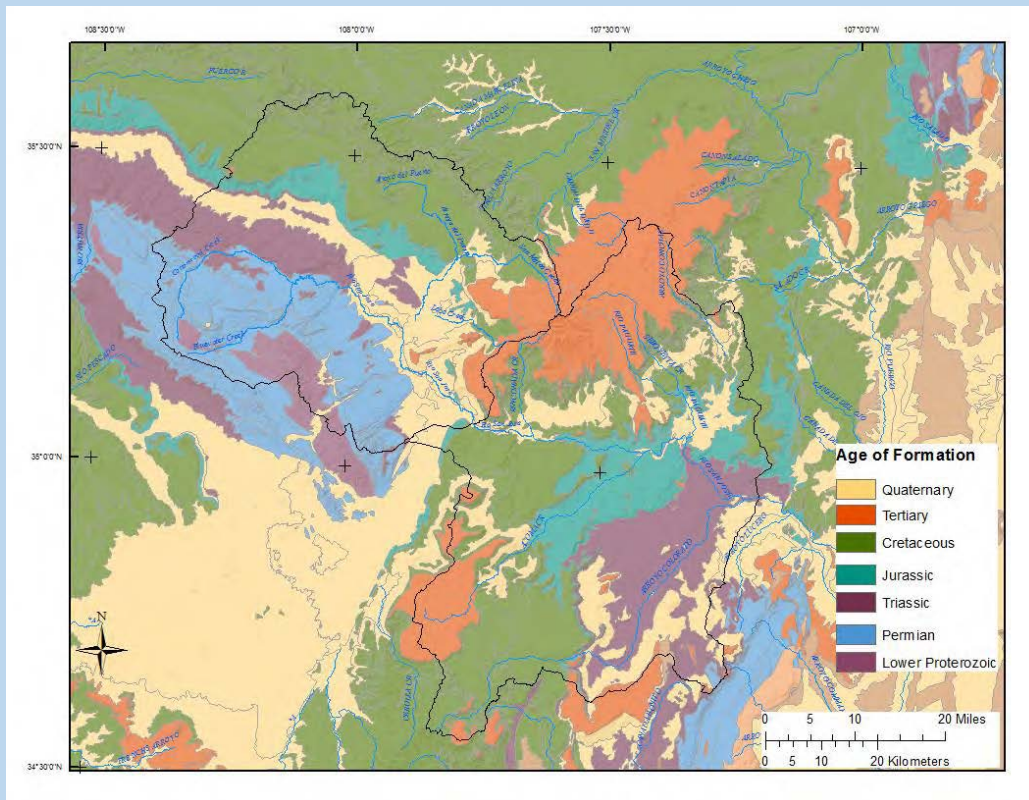
- Phase 1 is to characterize the hydrogeologic framework and water resources
- Phase 2 is to use the integrated hydrologic flow model to evaluate the possible regional effects of different water-use and climate scenarios on the basin's water-resources.



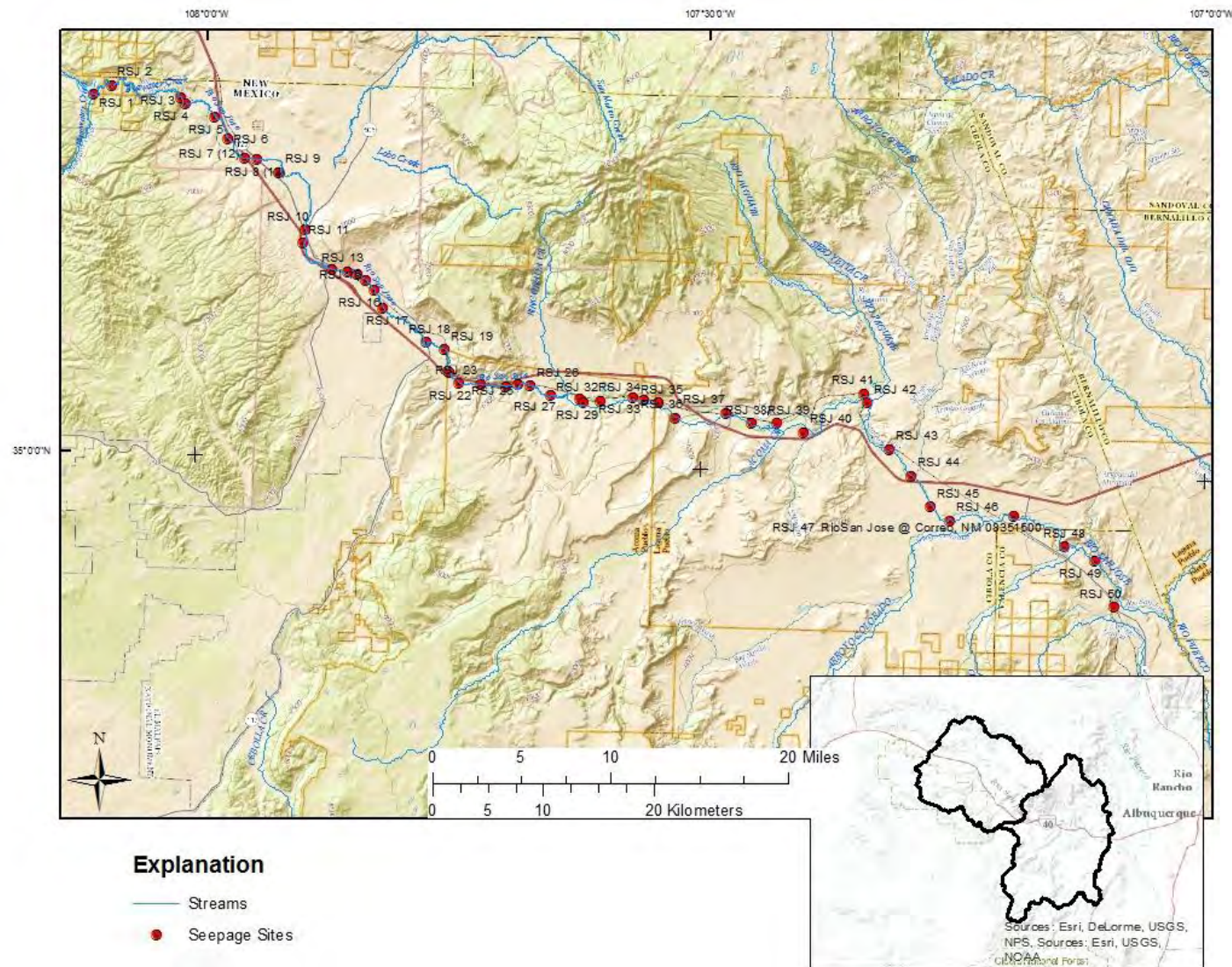
Rio San Jose
Watershed

Phase 1 – Conceptual Model of the Basin

- Develop the Hydrogeologic Framework
- Create Potentiometric-Surface maps
- Recharge and Aquifer Mixing



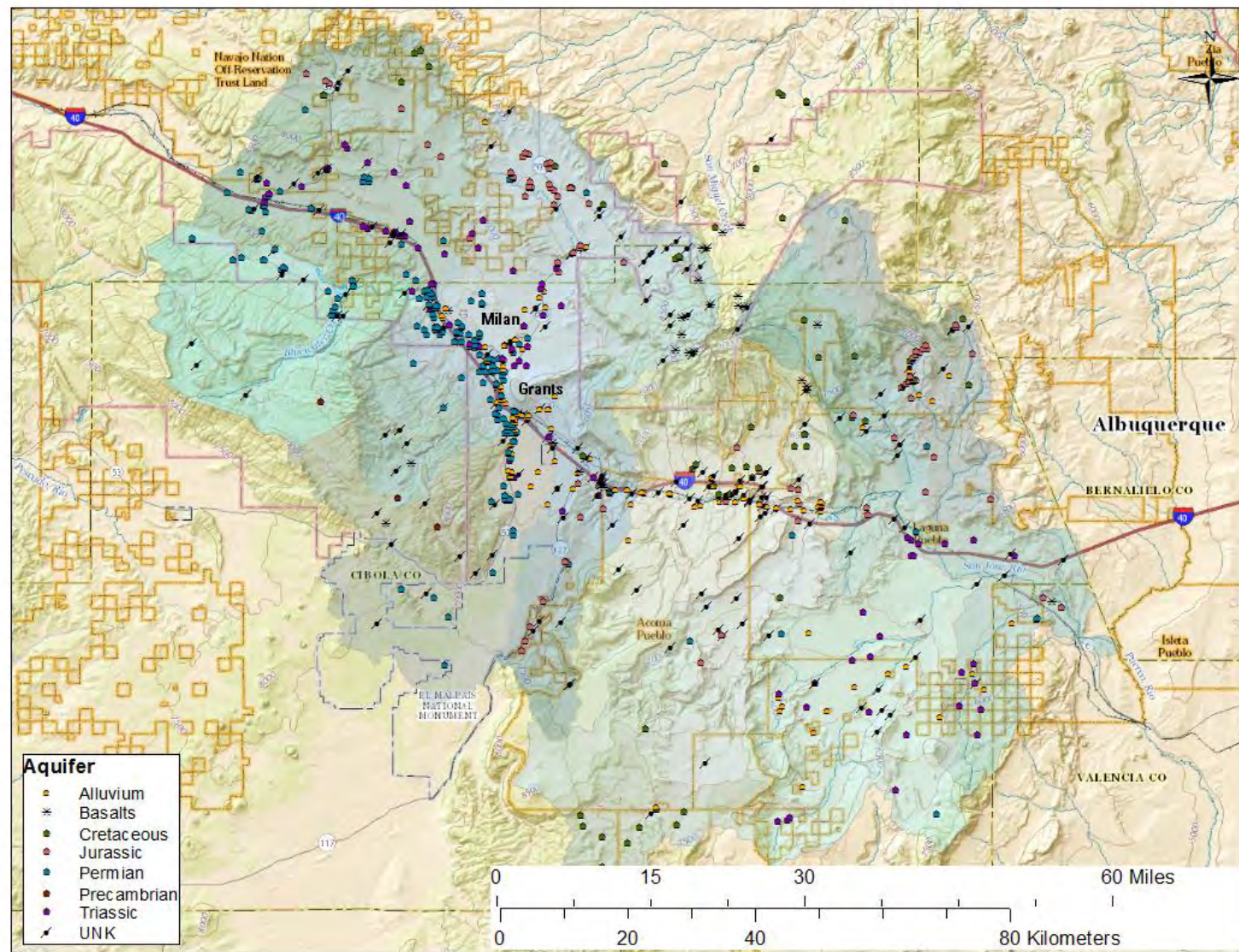
Surface Water



Seepage Investigation

- 43 discharge sites
 - 10 sites dry
 - 1 Tributary
- 29 water quality sites
 - Major Ions
 - Trace Elements
 - Nutrients
 - Stable isotopes of water
- SIR draft completed

Groundwater



Wells by formation (NWIS)

- 191 in San Andres / Glorieta
- 95 Chinle
- 91 in Morrison
- 65 Mancos/Dakota
- 134 Alluvium (28 in basalts)
- *197 Unreported

Other sources

Dinwiddie and Motts, 1964
Risser and Lyford 1983 and 1984
Keller and Bliesner, 2006

February 2017 Status

- 12 Dry
- 80 Measured
- 87 UTM
- 50 obstructed or destroyed

Groundwater Water Quality

- Sampled 19 Sites
 - 8 Production wells
- Analysis
 - Field Parameters (TOPS and alkalinity)
 - Major Ions
 - Trace elements
 - Stable Isotopes of water
 - Dissolved Gases
 - Age-Dating tracers
 - CFCs
 - SF6
 - Carbon 14
 - Tritium

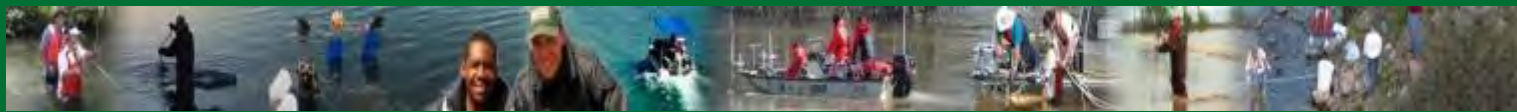


Phase 2 – Integrated Hydrologic Model (GSFLOW)

- Numerical groundwater-flow model (MODFLOW-NWT)
 - Build on Frenzel 1992 and Kernodle 1995
 - Anticipate using a minimum of 10 hydrostratigraphic units.
 - Stress periods will be monthly to capture seasonal changes.
 - Calibrate steady-state model to observed heads and flows.
 - 600' uniform grid cells.
- Watershed Model (PRMS)
 - PRMS being developed independently by Dave Moeser.
 - Will be calibrated prior to coupling.
 - Currently in the process of refining hydrologic response units (HRUs).

Questions?





The Source of Groundwater and Solutes to Many Devils Wash at a Former Uranium Mill Site, Shiprock, NM

Background:

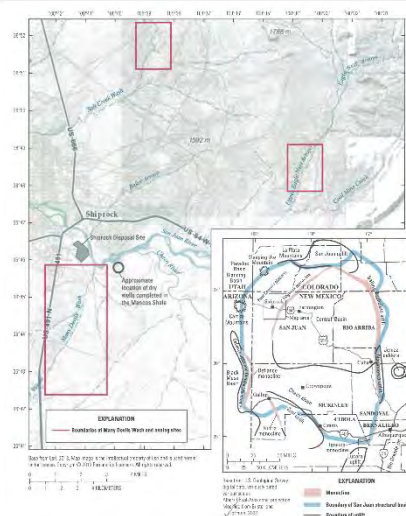
The Shiprock Disposal Site is the location of the former Navajo Mill (Mill), a uranium ore-processing facility, located in the town of Shiprock, New Mexico. Following the closure of the Mill, all tailings and associated materials were encapsulated in a disposal cell built on top of the former Mill and tailings piles. The milling operations, conducted at the site from 1954 to 1968, created radioactive tailings and process-related wastes that are now found in the groundwater.

Results:

- The spatial extent of the Mill affects to the local groundwater were determined by using uranium alpha activity ratios ($^{234}\text{U}/^{238}\text{U}$ ARs) and sulfur isotopes of sulfate ($\delta^{34}\text{S}_{\text{sulfate}}$) measured in groundwater samples.
- Age-dating tracers (CFCs and tritium) and stable isotopes of water (δD and $\delta^{18}\text{O}$) were used to determine that groundwater in MDW was focused recharge of precipitation.
- A conceptual model of the Mancos Shale weathering was developed from major-ion geochemistry to show that constituents in the groundwater of the MDW watershed were evolved through weathering in ion-exchange reactions.

Objectives:

To increase understanding of the source of water and solutes to the groundwater beneath Many Devils Wash (MDW) and to establish the background concentrations for groundwater that is in contact with the Mancos Shale at the site



Administrative Details:

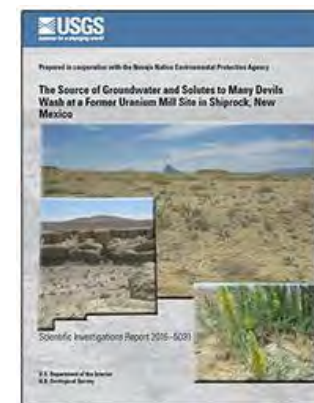
Timeline – Since 1987

Project Chief – Andrew Robertson
(ajrobert@usgs.gov)

Cooperator(s) – Navajo Nation
Environmental Protection Agency

Status – Phase 1 completed

Deliverables and other details –
Scientific Investigations Report 2016-5031



The Source of Groundwater and Solutes to Many Devils Wash at a Former Uranium Mill Site, Shiprock, NM

Prepared in cooperation with the Navajo Nation Environmental Protection Agency

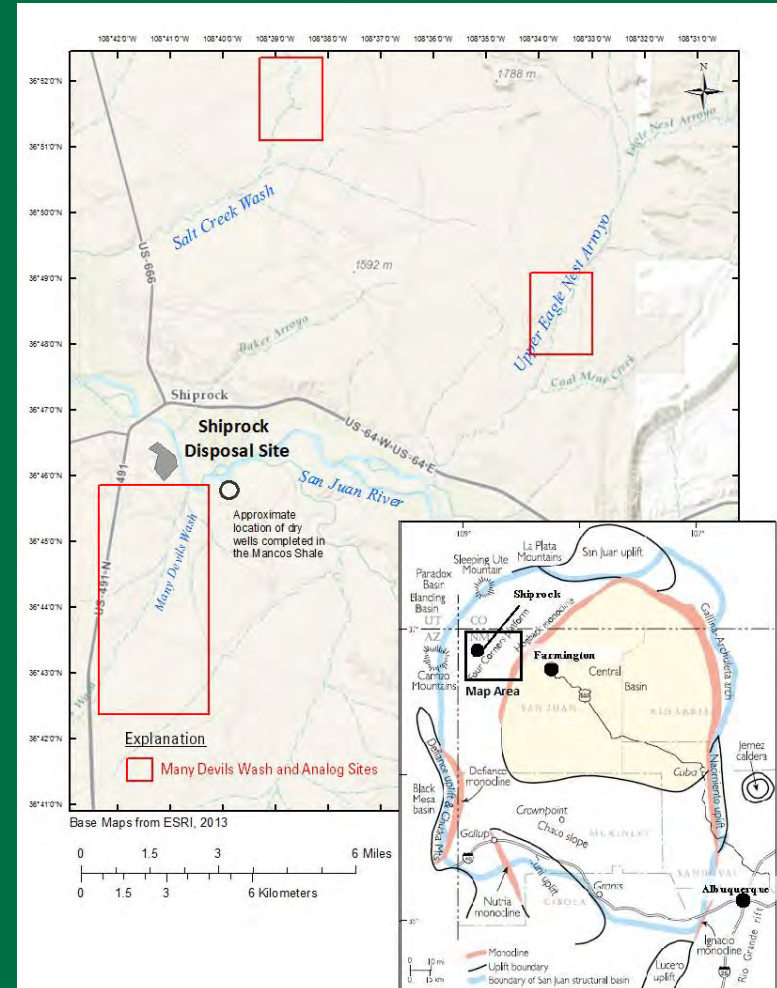


Objective: to present evidence for the source of groundwater and solutes discharging to Many Devils Wash and to establish the background concentrations for groundwater that is in contact with the Mancos Shale at the site.

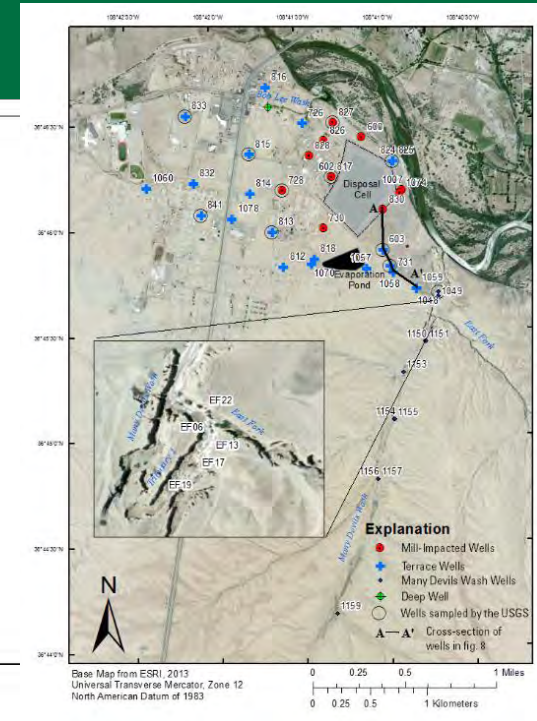
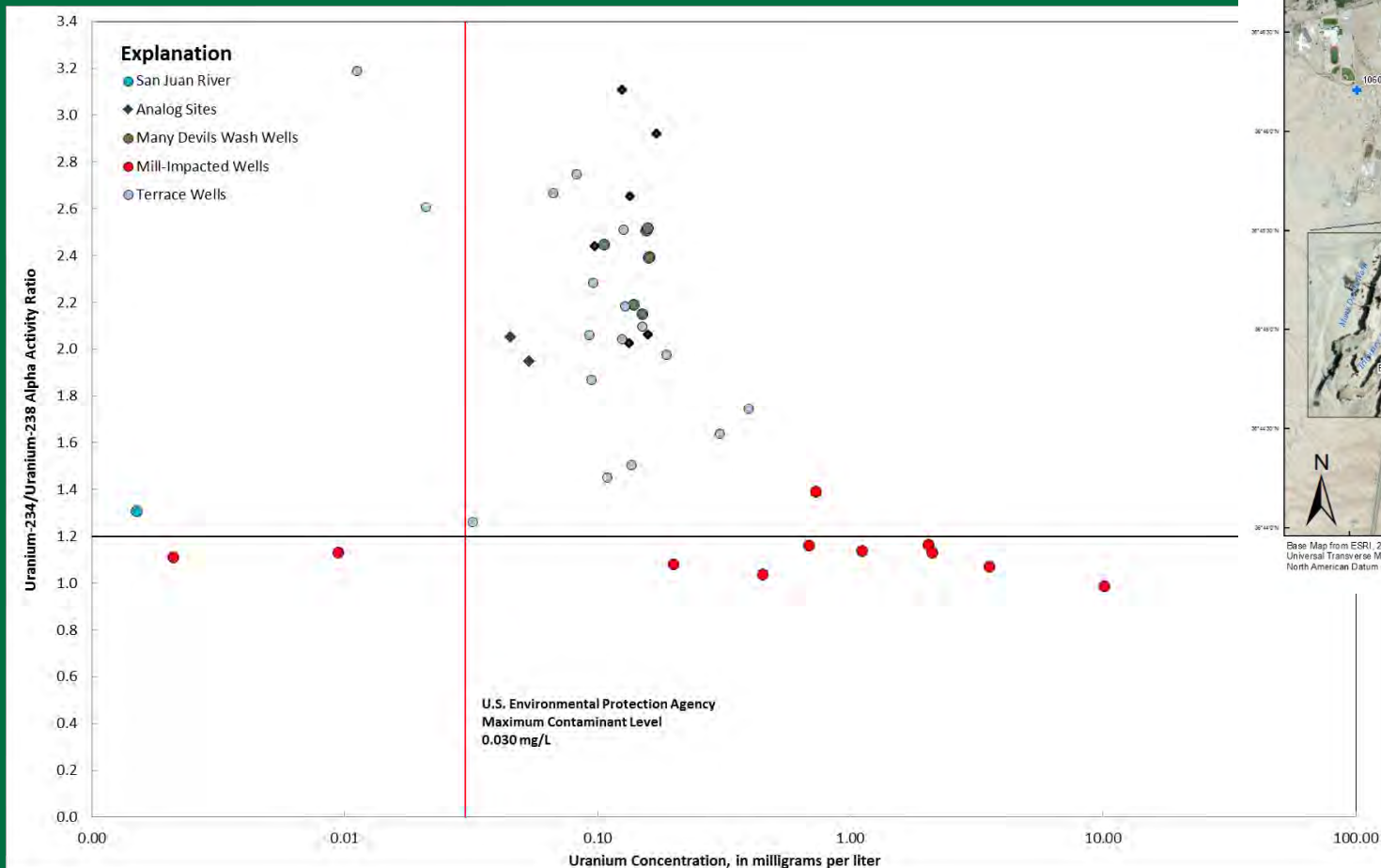


The Source of Groundwater and Solutes to Many Devils Wash at a Former Uranium Mill Site, Shiprock, NM

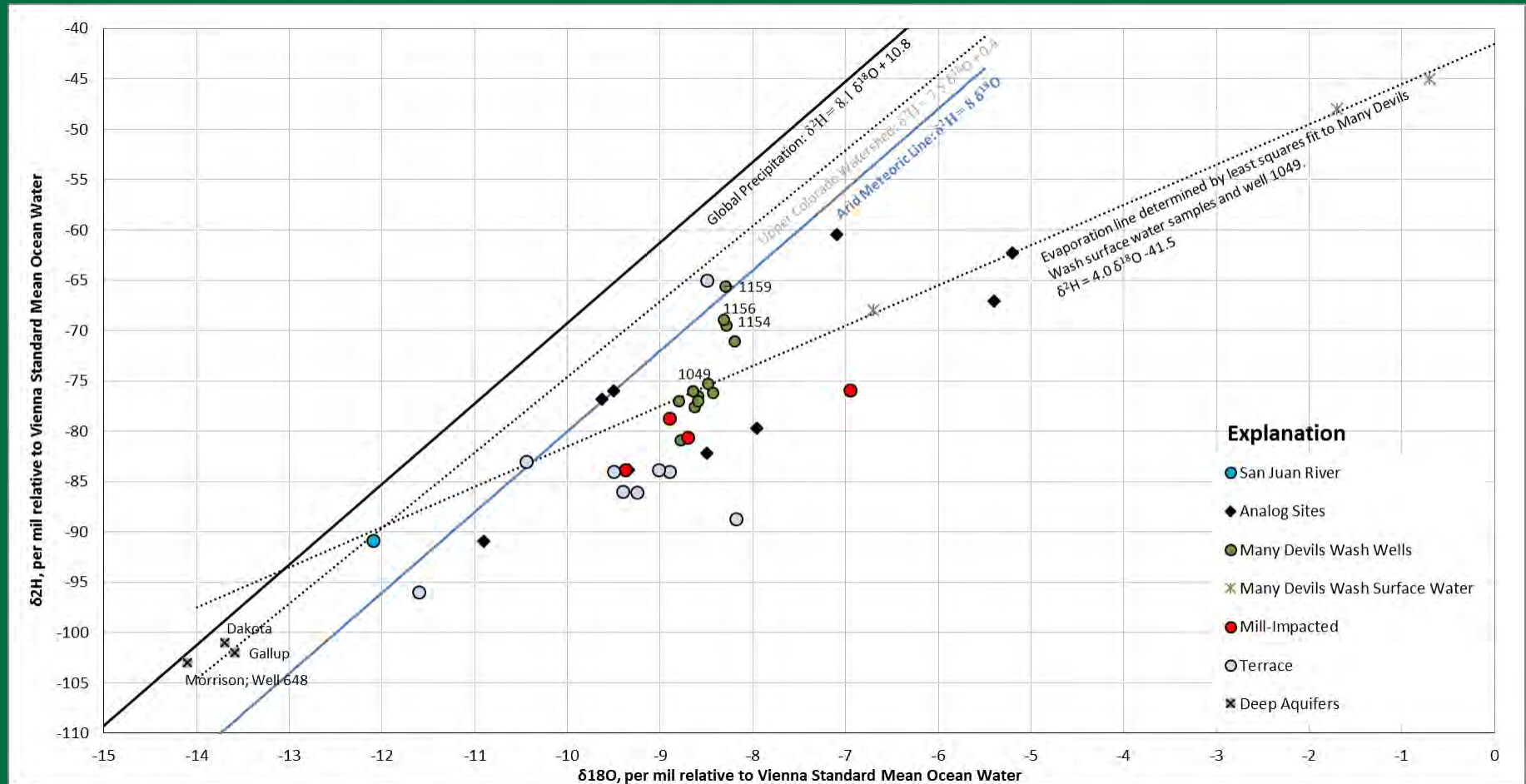
- The Shiprock Disposal Site is the location of the former Navajo Mill (Mill), a uranium ore-processing facility, which was in operation from 1954 to 1968.



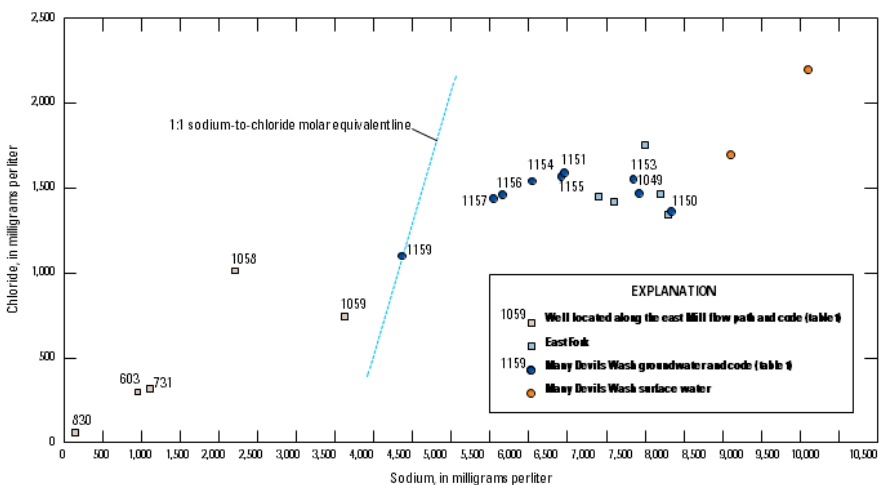
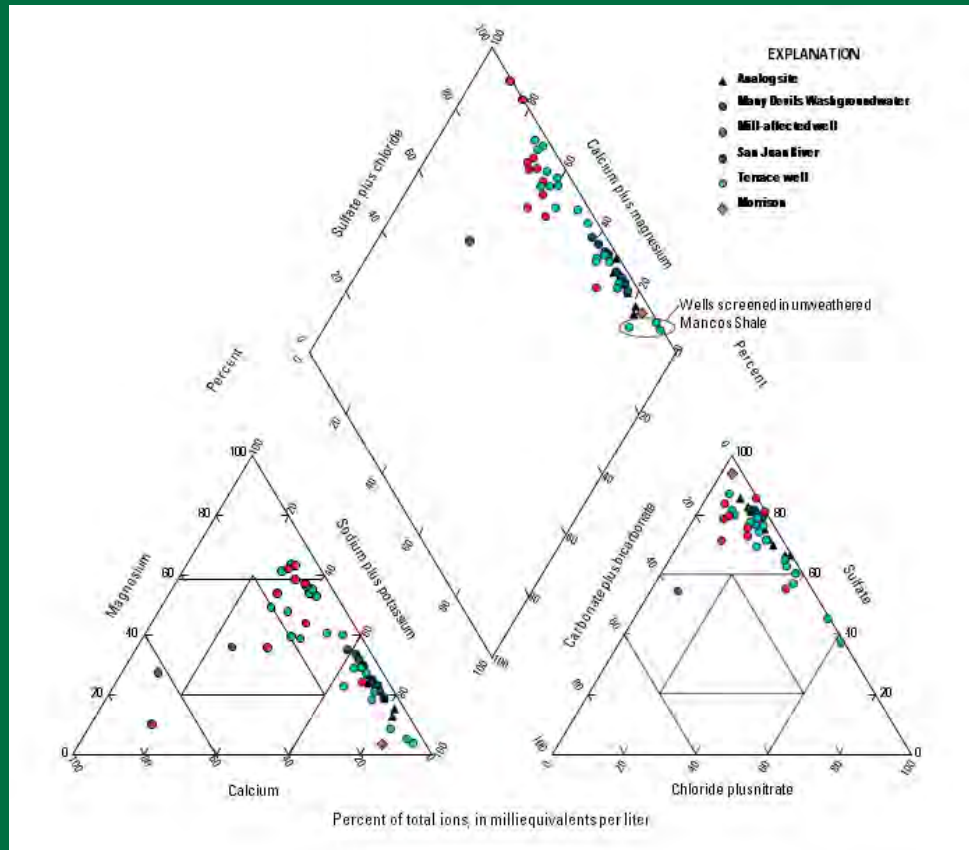
The Source of Groundwater and Solutes to Many Devils Wash at a Former Uranium Mill Site, Shiprock, NM



The Source of Groundwater and Solutes to Many Devils Wash at a Former Uranium Mill Site, Shiprock, NM



The Source of Groundwater and Solutes to Many Devils Wash at a Former Uranium Mill Site, Shiprock, NM



Questions?

Uranium mobility and accumulation along the Rio Paguete, Jackpile Mine in Laguna Pueblo, NM

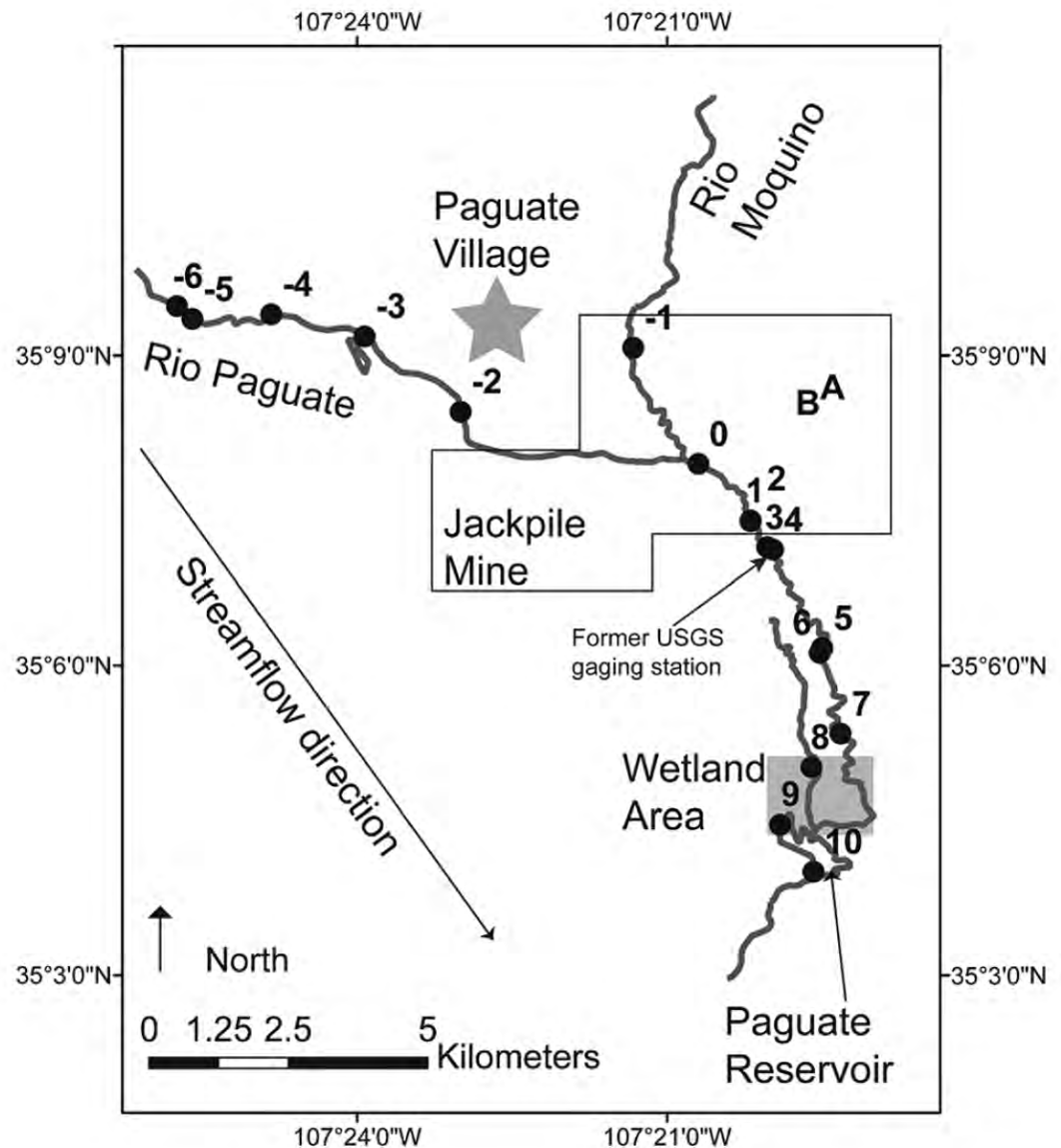


Fig. 1 Site map. Water and sediment samples were taken from locations -6 to +10. Ore and weathered sediment below the ore were sampled at sites A and B respectively.

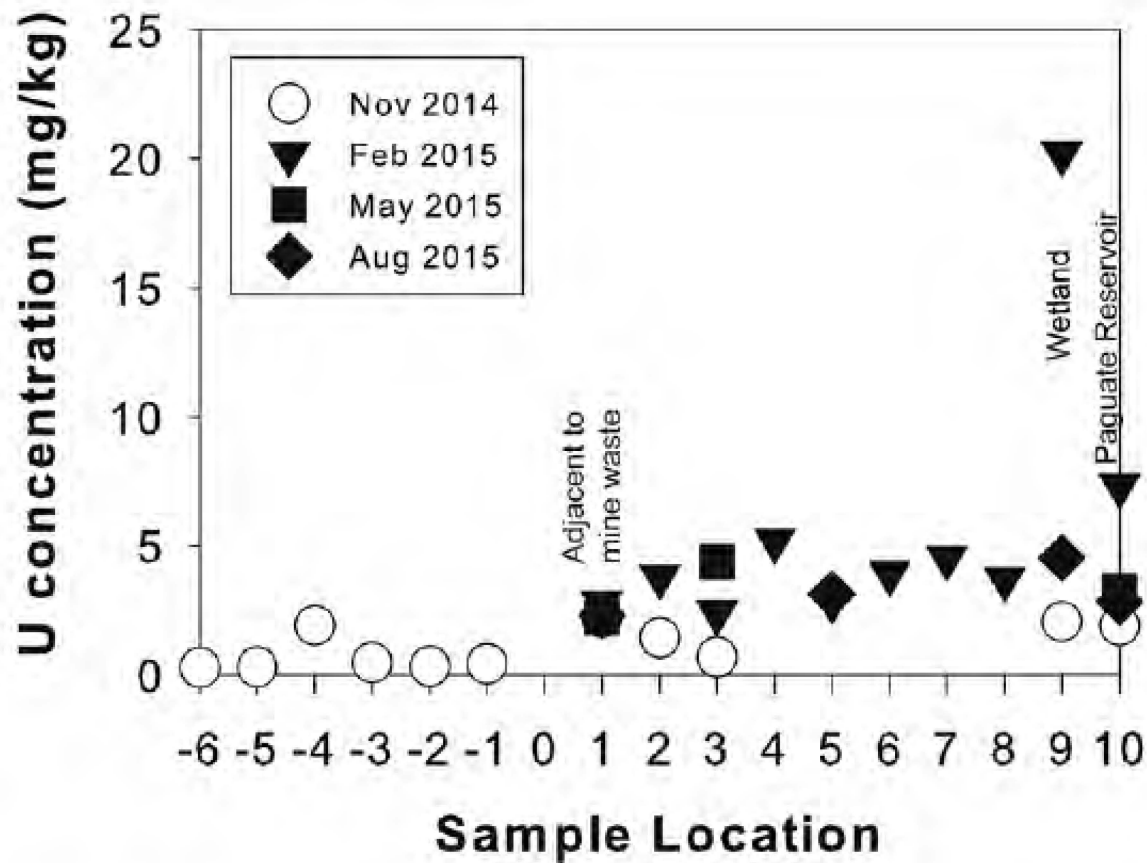


Fig. 3 Stream bed sediment U chemistry by sample location and month. The majority of samples are 2 times the local background U concentration of $1\text{--}2\text{ mg kg}^{-1}$. Sites 9 and 10 (the wetland and reservoir) have the highest U concentrations in the sediments.

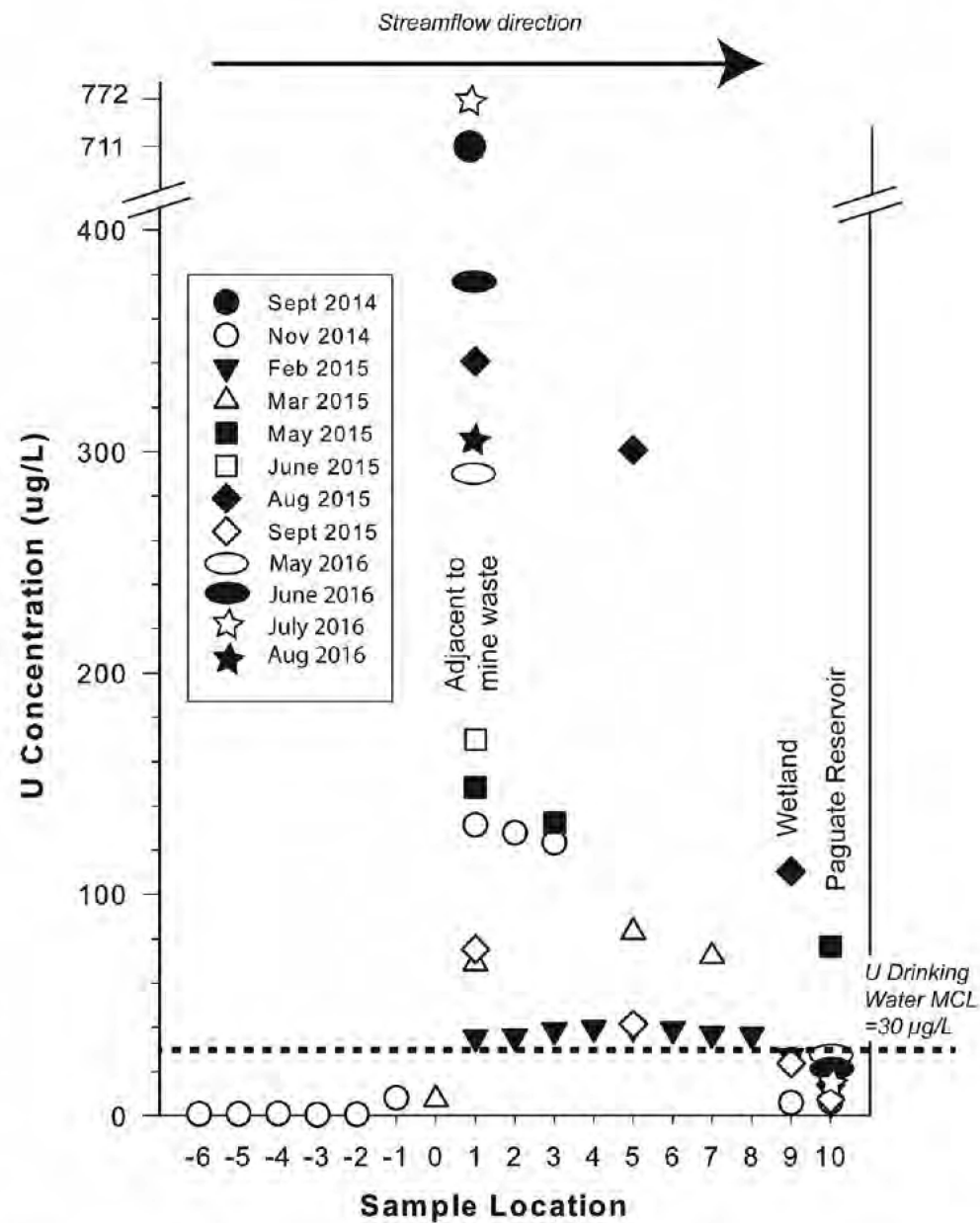


Fig. 7 Concentration of U ($\mu\text{g L}^{-1}$) in surface water by sample location and month.

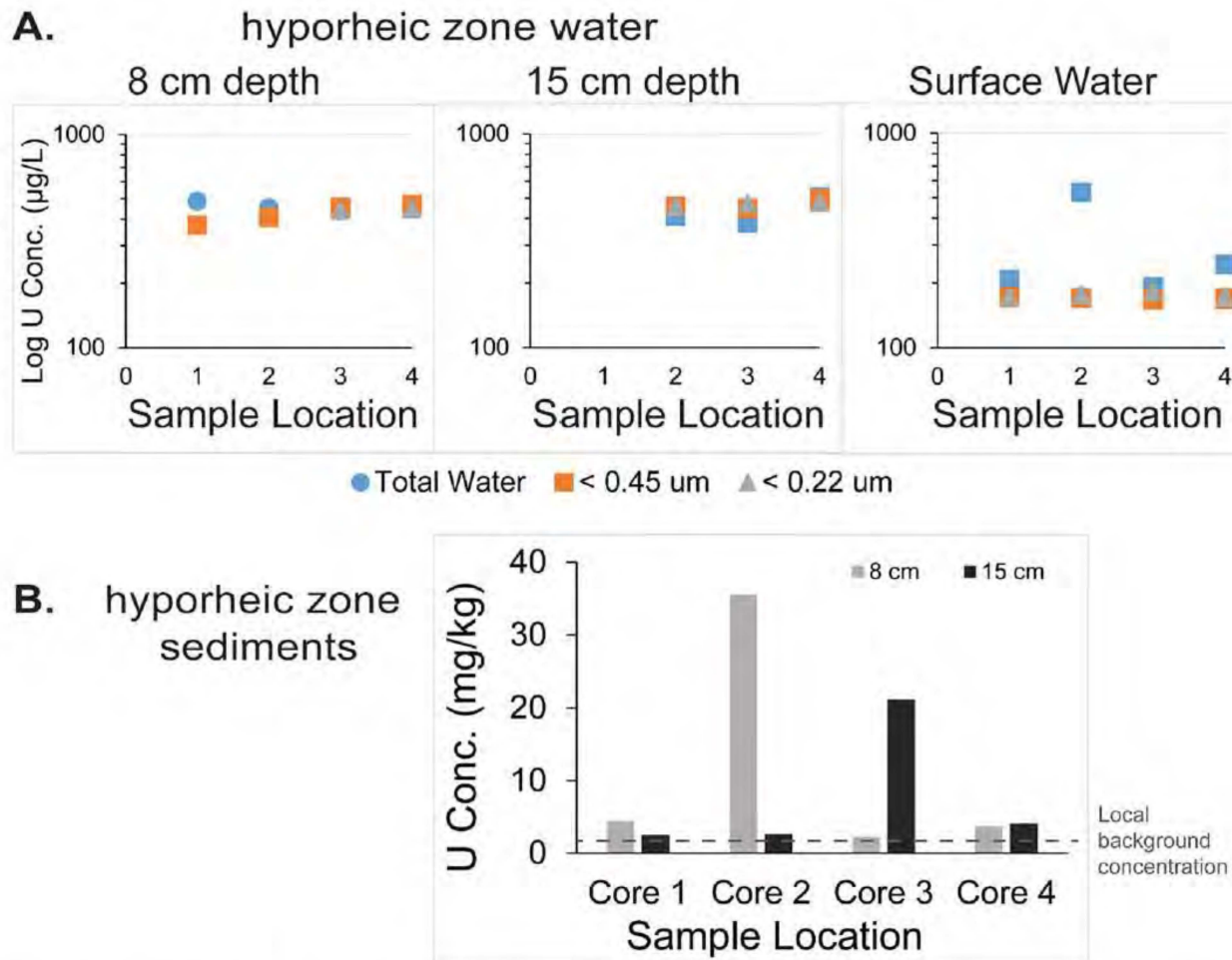


Fig. 10 (A) U concentrations from 8 cm and 15 cm below the sediment–water interface and surface water separated by total water (blue circles), <0.45 μm (orange squares), and <0.22 μm (gray triangles). (B) Concentration of U in hyporheic zone sediments from 8 cm (gray bars) and 15 cm (black bars).

Questions?



Thank You!

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